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Puccinia, Uromyces, and *Xenodochus* species new to Turkey

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Abstract — The genus *Xenodochus* and nine rust taxa —*Xenodochus carbonarius*, *Puccinia hysteriiformis*, *P. majoricensis*, *P. pedunculata*, *P. stachydis*, *P. tendae*, *Uromyces colchici*, *U. kochiae, U. veratri*— are reported for the first time from Turkey. The morphological and microscopical features of these fungi are described.

Key words — Anatolia, Ardahan, Kars, *Pucciniales*, *Uredinales*

Introduction

The rust genus *Xenodochus*, with only seven species worldwide, differs from *Phragmidium* and *Frommeella* by teliospores having one germ pore in the apical cell and two or more germ pores in all other cells. *Puccinia,* the largest genus of *Uredinales* with about 3000 to 4000 species, has been recorded in all land areas except the polar regions.

In the last 10 years reports of new taxa and records of rust fungi have greatly increased in Turkey (Bahcecioglu & Gjærum 2003, 2004; Bahcecioglu & Yildiz 2005; Kabaktepe & Bahcecioglu 2005, 2006; Bahcecioglu et al. 2005, 2006, 2009; Kirbag 2003, 2004; Kirbag et al. 2011). Although approximately 350 rust species representing 26 genera have been recorded from Turkey, this number is far less than the total number of potential host plants, and further studies are required on rust fungi in Turkey.

This paper presents rust species collected from Kars and Ardahan provinces in northeast Turkey.

Materials & methods

Materials were collected during 2006–09 from Kars and Ardahan Provinces in Turkey. The host specimens were prepared according to established herbarium techniques. Spores were scraped from dried host specimens and mounted in lactophenol. The preparations were examined with an Olympus CX31 light microscope and micrographs taken with a Olympus E–330 camera. Analysis LS Starterwas software used to measure

at least 30 spores for each spore state. Host names follow Davis (1965–85) and Davis et al. (1988). Specimens are deposited in the Inonu University Herbarium (INU), Turkey.

Taxonomy

Xenodochus carbonarius Schltdl., Linnaea 1: 237 (1826)

Telia amphigenous, pulvinate, 1–2 mm diam, black. Teliospores elongate–cylindrical, often curved, 6–15 celled, rounded at the both ends, strongly constricted, smooth but subverruculose at the apex, 97–250 × 24–28 µm, each cell with 2 opposite superior pores, the uppermost with one apical pore with a small hyaline papilla, wall brown in basal cells often nearly colorless, 2 µm thick, pedicel short, colorless, persistent.

Known on *Sanguisorba officinalis* from Asia, Europe, and North America; *X. carbonarius* is a new rust species and *Xenodochus* a new genus for Turkey.

Specimens examined – On *Sanguisorba officinalis* L. (*Rosaceae*): **TURKEY**: **Ardahan**, 30 km from Cildir to Hanak, 1950 m, 10.07.2006, Sanli Kabaktepe 4109 (INU 8534); 20 km Cildir to Ardahan, 1880 m, 23.09.2006, Sanli Kabaktepe 4732 (INU 8535).

Puccinia hysteriiformis Peck, Bot. Gaz. 6: 276 (1881)

Telia amphigenous, scattered, covered by the epidermis, ≤ 1 mm diam, brown. Teliospores oblong or oblong-clavate, 40–45 × 19–23 µm, constricted at the septum, pores usually indistinct, pore of upper cell apical, pore in lower cell near the septum, wall 1.5–2.5 µm, at apex ≤ 4–9 µm, pale brown, smooth, pedicel ≤ 106 µm, persistent, hyaline.

Known from Europe, North America, and South America; *P. hysteriiformis* is a new rust species for Turkey.

Specimen examined – On *Minuartia recurva* (L.) Schinz & Thell. (*Caryophyllaceae*). **TURKEY**: **Kars**, Duman Mountain, 2000 m, 08.07.2006, Sanli Kabaktepe 4023 (INU 8537).

Puccinia majoricensis Maire, Bull. Soc. Myc. Fr. 21: 221 (1905)

Telia hypophyllous on stem and petioles, ≤ 1 mm diam, scattered or in groups, dark brown. Teliospores ellipsoid, oblong, 38–59 × 14–17 µm, constricted at the septum, pore of upper cell apical, wall 1–1.5 µm, at apex up to 5–8 µm, yellowish brown, at apex pale brown, smooth, pedicel ≤ 90 µm, persistent, pale yellow or hyaline.

Known from Asia and Europe, *P. majoricensis* is a new rust species for Turkey.

Specimens examined – On *Teucrium chamaedrys* L. (*Lamiaceae*). **TURKEY**: **Ardahan**, Posof, Dogrular village, 1600 m, 28. 08. 2008, Sanli Kabaktepe 6551(INU 8538); 13–15 km from Ardahan to Gole, 1850 m, Sanli Kabaktepe 6836 (INU 8539).

Remarks —*Puccinia annularis* (F. Strauss) G. Winter on *Teucrium chamaedrys* and *T. polium* L. (Bahcecioglu & Yildiz 2005; Kabaktepe & Bahcecioglu 2006;

Bahcecioglu et al. 2006) and *P. constricta* (Lagerh.) Bubák on *Teucrium orientale* L. (Bahcecioglu & Gjærum 2004) have also been reported from Turkey. *Puccinia majoricensis* differs from *P. annularis* by dark colored teliospores, and differs from *P. constricta* by a bigger and hyaline pedicel.

Puccinia pedunculata J.Schröt., Jber. schles. Ges. vaterl. Kultur 52: 117 (1875)

Uredinia hypophyllous, covered by the epidermis, roundest, scattered, reddish brown. Urediniospores ellipsoid, ovoid, 28–35 × 20–24 µm, wall 2.5–3 µm thick, pale brown, aculeate, 5–6 scattered pores. Telia hypophyllous, on stems, covered by the epidermis, dark brown. Teliospores ellipsoid, oblong or oblong-clavate, the upper cell broader, rounded or slightly attenuate, 41–58 × 20–26 µm, slightly or not constricted at the septum, pore of upper cell apical, wall smooth, chestnut brown, 1.5–2.5 µm, at apex 5–9 µm, pedicel ≤ 80 µm, persistent, brownish.

Known from Europe, *P. pedunculata* is a new rust species for Turkey.

Specimen examined – On *Rumex scutatus* L. (*Polygonaceae*). **TURKEY**: **Kars**, Sarikamis, Catak village, 1750 m, 24.08.2009, Sanli Kabaktepe 6934 (INU 8540).

Remarks — *Puccinia acetosae (*Schumach.) Korn. on *Rumex scutatus*, *R. tuberosus* L., and *R. acetosella* L. have been reported from Turkey. (Bahcecioglu & Yildiz 2005; Bahcecioglu et al. 2006; Tamer 1978). *Puccinia pedunculata* differs from *P. acetosae* by not being constricted at the septum and lacking a papilla on the upper teliospore cell.

Puccinia stachydis DC., Fl. franc. 2: 595 (1805)

Uredinia amphigenous, rounded, scattered, brown. Urediniospores ellipsoid, globoid, 25–28 × 24–26 µm, wall 2–3 µm thick, brown, aculeate with 2–3 pores. Telia similar to uredinia but dark colored. Teliospores ellipsoid or oblong, 37–47 × 19–23 µm, constricted at the septum, pore of upper cell apical, wall smooth, chestnut brown, ≤ 6–11 µm thick at the apex, pedicel as long as spores, persistent, hyaline.

Known from Europe, *P. stachydis* is a new rust species for Turkey.

Specimens examined – On: *Stachys annua* L. (*Lamiaceae*). **TURKEY**: **Ardahan**, 16–18 km Haskoy to Ardahan, 1850 m, 17.09.2008, Sanli Kabaktepe 6675 (INU 8541). **Kars**, Sarikamis, Catak village, 1750 m, 24.08.2009, Sanli Kabaktepe 6935 (INU 8542).; Sarikamis, 2100–2500 m, 25.08.2009, Sanli Kabaktepe 6996 (INU 8543).

Remarks —*Puccinia hariotii* Lagerh. on *Stachys* spp. (Henderson 1957) and *P. betonicae* (Alb. & Schwein.) DC. on *S. iberica* M. Bieb. and *S. citrina* Boiss. & Heldr. (Bahcecioglu & Yildiz 2005; Bahcecioglu & et al. 2006) have been reported from Turkey. *Puccinia stachydis* differs from *P. hariotii* by constriction at the septum and a persistent pedicel and from *P. betonicae* by pale colored teliospores and a persistent pedicel.

Puccinia tendae Gäum., Rev. Mycol. 18: 184 (1953)

Uredinia hypophyllous, rounded, scattered, pale brown. Urediniospores ellipsoid, globoid, 13–28 × 18–26 µm, wall 1.5 µm thick, brown, echinulate with 2–3 equatorial pores. Telia similar to uredinia but dark colored. Teliospores ellipsoid or oblong, 35–50 × 19–22 µm, constricted at the septum, pore of upper cell apical, wall smooth, pale chestnut brown, 2–3 µm thick, at apex up to 9 µm thick, pedicel ≤ 100 µm, persistent, hyaline.

Known from Europe, *P. tendae* is a new rust species for Turkey.

Specimen examined – On *Thymus fedtschenkoi* Ronniger (*Lamiaceae*). **TURKEY**: **Kars**, 8 km from Kagizman to Tuzluca, 1140 m, 12. 06. 2007, Sanli Kabaktepe 4989 (INU 8544).

Remarks —*Puccinia serpylli* Lindr. on *Thymus fallax* Fisch. & C.A. Mey., *T. fedtschenkoi,* and *T. kotschyanus* Boiss. & Hohen. (Henderson 1959, 1964; Bahcecioglu & Gjærum 2004; Bahcecioglu et al. 2006) has been reported from Turkey. *Puccinia tendae* differs from *P. serpylli* by narrow, dark colored teliospores.

Uromyces colchici Massee, Grevillea 21: 6 (1892)

Telia amphigenous, scattered, rather large, elliptical, sometimes circinate, up to 2 mm long, covered for some time by the epidermis, brown. Teliospores subgloboid to ovoid, rounded above with a flat hyaline papilla, 28–40 × 20–28 µm, smooth, pale brown, wall 2.5–3.5 µm thick, pedicel deciduous, hyaline.

Known from Europe, *U. colchici* is a new rust species for Turkey.

Specimen examined – On *Colchicum speciosum* Steven (*Colchicaceae*). **TURKEY**: **Ardahan**, Bulbilen Mountain, 2400 m, 18.07.2007, Sanli Kabaktepe 5423 (INU 8545).

Uromyces kochiae Syd. & P. Syd., Annls mycol. 10: 215 (1912)

Uredinia amphigenous, small, scattered, black. Urediniospores globoid, subgloboid, 21–25 × 21–24 µm, wall 1.5–2.5 µm thick, yellowish brown, echinulate with 6–9 pores. Telia similar to uredinia. Teliospores globoid, ellipsoid, 18–23 × 16–18 µm, wall smooth, brown, at apex dark colored, up to 3–5 µm thick at apex, pedicel ≤ 100 µm, persistent, hyaline.

Known from Asia and Europe, *U. kochiae* is a new rust species for Turkey.

Specimens examined – On *Kochia prostrata* (L.) Schrad. (*Chenopodiaceae*). **TURKEY**: **Kars**, 20 km from Digor to Igdir, 1500 m, 07.07.2006, Sanli Kabaktepe 3989 (INU 8546).; Kagizman, Esenkir village, 1220 m, 01.07.2008, Sanli Kabaktepe 6033 (INU 8547).

Uromyces veratri (DC.) J. Schröt., Jber. schles. Ges. vaterl. Kultur 49: 10 (1871)

Uredinia hypophyllous, rounded, scattered, chestnut brown. Urediniospores ellipsoid, 22–26 × 19–20 µm, wall 1–2 µm thick, pale brown, aculeate with 1–3 equatorial pores. Telia amphigenous, scattered, pulverulent, up to 2 mm long,

covered by the epidermis, blackish brown. Teliospores ellipsoid, ovoid, oblong, 22–30 × 14–18 µm, at apex with a flat hyaline papilla, wall smooth, brown, ≤ 7 µm thick at apex, pedicel deciduous, brownish.

Known from Asia and Europe, *U. veratri* is a new rust species for Turkey.

Specimen examined – On *Veratrum album* L. (*Melanthiaceae*). **TURKEY**: **Ardahan**, Posof, Ilgar mountain pass, 2540 m, 26.08.2009, Sanli Kabaktepe 7023 (INU 8548).

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